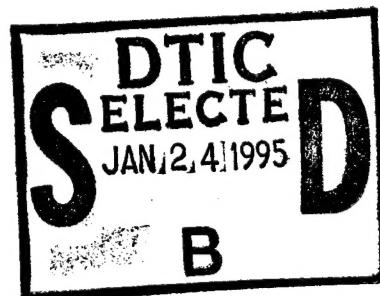


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# STRATEGIC ENVIRONMENTAL RESEARCH AND DEVELOPMENT PROGRAM



INTERIM STATUS REPORT  
OF THE COUNCIL  
OCTOBER 1993



SERDP

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## **FOREWORD**

The Strategic Environmental Research and Development Program (SERDP) is mandated in Title 10 U.S.C. §§2901-2904. SERDP addresses environmental matters of concern to the Department of Defense (DoD) and the Department of Energy (DOE). It is conducted as a tri-agency program with participation from the DoD, DOE and Environmental Protection Agency (EPA).

The SERDP identifies and develops technology to enhance capabilities to meet environmental commitments and to foster the exchange of scientific information and technologies among the participants, other governmental agencies and the private sector. The SERDP interacts with other environmental programs to identify and solve defense specific needs, extends applications of defense information to others, and builds on existing science and technology to derive more useable and cost effective approaches for achieving reductions in environmental risks.

The SERDP is managed by: a Council, which prescribes policies and procedures to implement the program; a Scientific Advisory Board, which advises the Council; and, an Executive Director and his staff, who handle the day-to-day management of the SERDP. The voting members of the SERDP Council are: the Director of Defense Research and Engineering; the Deputy Under Secretary of Defense for Environmental Security; the Vice Chairman of the Joint Chiefs of Staff; the Assistant Secretary of the Air Force, Space; the Assistant Secretary of Energy for Defense Programs; the Assistant Secretary of Energy for Environmental Restoration and Waste Management; the Director of the DOE Office of Energy Research; and, the Administrator of the EPA. Representatives from the Military Departments, the Coast Guard, and the Executive Director round out the Council as non-voting members. The list of members for the SERDP Scientific Advisory Board is shown in their annual report for FY 1992, which was submitted to Congress in April 1993.

This interim status report summarizes Phase I and Phase II projects, including data gathered through July 1993. It covers FY 1991 funding of \$69 million, FY 1992 funding of \$10 million, and \$69.8 million from the FY 1992 supplemental. SERDP funds remaining after the June 1992 rescission, \$69 M (FY 1991) and \$10 M (FY 1992), were distributed beginning in July 1992. After the required Scientific Advisory Board review, funds from the FY 1992 supplemental were allocated to performers from October 1992 through January 1993. In early July 1993, the SERDP Council approved the FY 1993 Strategic Investment Plan. FY 1993 funds for projects covered by this plan were released in September 1993, after the 30-day Congressional review had been completed. The details of the funding distribution for FY 1993 will be presented as a part of the FY 1994 Annual Report.

For the FY 1991/1992 program SERDP projects were grouped under four categories -- Remote Sensing, Installation Restoration and Waste Management, Energy, and Other, which included the Arctic Supercomputer project. Individual research projects were reviewed and

selected by the SERDP Council to fit an overall project funding target of \$166 million. Approved projects were submitted to Congress on April 4, 1992 for its 30-day review. Projects which requested \$1 million, or above, were reviewed by the SERDP Scientific Advisory Board (SAB) at meetings on June 11-12 and July 28-29, 1992.

## ACRONYMS

ARPA	Advanced Research Projects Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRADA	Cooperative Research and Development Agreement
CWA	Clean Water Act
DDR&E	Director, Defense Research and Engineering
DOE	Department of Energy
DoD	Department of Defense
DSPO	Defense Support Program Office
EPA	Environmental Protection Agency
HAZMIN	Hazardous Waste Minimization
HW	Hazardous Waste
IR	Installation Restoration
IVD	Ion Vapor Deposition
LOVA	Low Vulnerability Ammunition
NASA	National Aeronautics and Space Administration
NRC	National Research Council
NOAA	National Oceanic and Atmospheric Administration
NRL	Naval Research Laboratory
NSF	National Science Foundation
OSD	Office of the Secretary of Defense
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
SAB	Scientific Advisory Board
SARA	Superfund Amendments and Reauthorization Act
S&T	Science and Technology
SERDP	Strategic Environmental Research and Development Program
SITE	Superfund Innovative Technology Evaluation
USDA	United States Department of Agriculture
USGCRP	U.S. Global Change Research Program
VOC	Volatile Organic Compound
WM	Waste Management

## INTRODUCTION

This is an interim status report of the Strategic Research and Development Program (SERDP) Council. The report covers Phase I and Phase II projects and provides the current status of the program. Since the SERDP will be a part of the DoD budget submission starting in FY 1994, the first annual report, due March 1994, will report on the first year (FY 1994) of the five-year SERDP plan to be prepared by the SERDP Council during FY 1993 pursuant to 10 U.S.C. §2902(d)(3).

In April 1992 the Office of the Secretary of Defense (OSD) submitted the *SERDP Phase I Strategic Investment Plan, FY 1992* (hereafter designated as *Strategic Investment Plan I*) to Congress for its 30-day review. In July 1993 the *SERDP Phase II Strategic Investment Plan, FY 1992* (i.e., *Strategic Investment Plan II*) was sent to Congress. That submission was for the record, since the Appropriations Conference Report language accompanying the FY 1992 Supplemental Appropriation waived the need for the 30-day review of the Phase II program. OSD also submitted the *SERDP FY 1993 Strategic Investment Plan*, (i.e., *Strategic Investment Plan, FY 1993*) to Congress in early August 1993 for review.

The purpose of the SERDP is to address environmental matters of concern to the DoD and DOE. It is conducted as a tri-agency program with participation by DoD, DOE, and the EPA. The SERDP is intended to identify and develop technologies that will enhance the capability of DoD and DOE to meet their environmental commitments. In addition, it is intended to provide both technology and information that can be useful to governmental and private organizations in addressing environmental concerns. The SERDP interacts with other environmental programs to identify and contribute to the development of more effective and economical approaches to environmental problems.

This report describes the progress made to date as well as specific plans for the near term to address the goals of SERDP. The combined efforts of DoD, DOE, and EPA have been guided by the SERDP Council to assure that the SERDP is aggressively implemented. The efforts to date show there are opportunities for synergistically exploiting and transferring environmentally related technologies developed by the agencies to each other, and to other government and private organizations.

A Council decision on charging fees for information released in the SERDP program, as required by title 10 U.S.C. §2902(h)(a)(1), will be deferred until such time as the SERDP has begun to develop information suitable for transfer to the private sector.

The FY 1991/1992 SERDP projects reported here fall into the broad categories of Remote Sensing, Installation Restoration and Waste Management, and Energy. One specialized effort categorized as "Other" includes the Arctic Supercomputer.

## **PROGRAM SUMMARY**

The SERDP efforts to date have emphasized the transfer of technology and data for the assessment of the state of the global atmospheric and ocean environments; the effectiveness of clean-up technologies for hazardous waste materials; the approaches to minimize, treat, and dispose of hazardous waste; methods for assessing hazards in existing and restored sites; and identifying and demonstrating clean energy and energy conservation projects.

### **Remote Sensing**

Remote Sensing projects have focused on characterizing the global environment, using advanced technologies for detection, analysis, and evaluation. Advanced surveillance methods are being applied to oceanographic and land characterization. Archival data (both classified and unclassified from national assets) and new data will contribute to environmental modeling and analysis. Significant progress has been made in identifying data for public access that has been acquired and is under control of the Department of Defense. Data include the earth's radiation profile, tropospheric dynamics (chemistry, moisture, and temperature), and variation of trace constituents in the middle and upper atmosphere. Such data, which are critical to long-wave communications for military applications, also can be applied to predicting climatic changes.

Efforts were initiated to demonstrate the use of acoustics to monitor ocean temperatures, using technologies developed by the Navy and ARPA. This will provide an important tool to indicate global temperature change and will provide the basis for decisions on implementing a long-term acoustic measurement program.

### **Installation Restoration and Waste Management**

Site cleanup and waste management are being addressed by demonstrating the most promising technologies, evaluating their effectiveness, and providing specific selection and design criteria to potential users. Reduction in costs and time for restoration are being sought as well. Pollution prevention efforts are focused on waste reduction, materials substitution, and process modifications. For remaining waste problems, such as hazardous organic and inorganic chemicals, efforts are directed toward characterization methods for soil and groundwater, as well as means to restore them to environmentally acceptable levels.

### **Energy**

Demonstrations on alternative sources of energy and energy conservation means are directed at potential savings of \$200 million a year in military installations. Funded projects consist of several alternative technologies that have direct application for immediate use in the Department of Defense complex and may have a considerable impact on the utilities industry.

## **Other Technology Projects**

A grant was executed under which the University of Alaska shall serve as the owner, operator and administrator of the Arctic Region Supercomputing Center (ARSC). The ARSC shall serve the supercomputing needs of the SERDP and other DoD and national needs. The DoD will be entitled to 30 percent of the available CPU time at no additional charge.

The development of a reliable, cost-effective environmental management strategy for DoD sites is being pursued through the development of a scientifically defensible exposure-hazard-risk assessment methodology. This invaluable effort leverages the substantial investment made by EPA during its own Superfund Innovative Technology Evaluation (SITE) and assessment process and enhances this methodology for use by defense facilities.

In cooperation with the Office of the Secretary of Defense (OSD), EPA is preparing eight innovative technologies guidance manuals that provide potential permanent treatment options for contaminated waste sites at DoD installations.

Programs addressing DoD long term environmental R&D needs are being identified based upon user requirements and advancing technological capabilities for the development of a long term R&D strategy to guide the DoD into the next century.

## **ADDITIONAL TOPICAL REQUIREMENTS**

Section 2902(h)(2) of title 10, United States Code, sets forth specific requirements which will be included in the first SERDP Annual Report. The information presented on the following pages provides an interim response to these requirements.

**Section A. Actions to be taken during the five-year period covered by the plan to prevent duplication of research and development activities.**

### **A1. Activities within DoD Elements**

The Executive Director, SERDP, has worked closely with the Scientific Advisory Board, the SERDP Council and the multi-agency Working Group to develop a focused, well-coordinated program. Specific program execution, monitoring and reporting requirements will be implemented for the FY 1993 program. This is expected to facilitate the tracking and coordination of related efforts and ensure connectivity between Agencies. The principal coordinating mechanism within the Department of Defense remains within the guidance of Project Reliance.

Project Reliance's goal of eliminating duplication of Science and Technology activities and increasing the mutual reliance of the Services has been approached by analyzing the Services' Science and Technology programs, in particular, for the applicability of these programs to SERDP.

Project Reliance developed a conceptual framework to manage the transition from extensive, but informal cooperation to an increasing level of mutual reliance among the Services. The SERDP-related programs include technology areas in Environmental Quality (Oversight Responsibility: Joint Engineers), Environmental Science (Oversight Responsibility: Joint Directors of Laboratories - Environmental Sciences Panel), Medical (Oversight Responsibility: Armed Services Biomedical Research Evaluation and Management (ASBREM) Committee), and Civil Engineering (Oversight Responsibility: Joint Engineers).

At the direction of Congress as stated in the Department of Defense Appropriation Bill, 1993, Report from the Committee on Appropriations, Senate Report 102-408, the Executive Director was tasked to certify that all efforts conducted with the additional funds provided to 6.1 (Basic Research) Environmental Quality Technology Programs within each Service, were not duplicating SERDP efforts. This has been accomplished.

Within DDR&E, tri-service reviews in such large areas as Environmental Quality, Environmental Sciences, Human Systems and Civil Engineering provide forums for surfacing

SERDP opportunities among the Services, while providing another mechanism to identify and eliminate duplicative efforts.

All of the services have mechanisms that track environmental programs. The Air Force has an Environmental Quality RD&A Strategic Plan, which employs a goal-oriented approach to review requirements and match them against the research underway and planned to assure optimum focus. An active, institutionalized effort conducted by the Army involves periodic reviews of its technology base programs in concert with the Army's user elements. Both the user and the developer are represented on the Army's Technology Base Advisory group and can assess ongoing research in terms of requirements and new opportunities.

The Army each year produces a Technology Base Master Plan, which makes public its goals in satisfying established requirements, as well as plans for exploiting emerging technologies in environmental concerns. The Air Force has an Environmental Inter-Laboratory Research Plan that captures all research in Environmental Quality, Safety, and Occupational Health. These efforts include an assessment and exploitation of research available in the private sector as well.

At the direction of the Deputy Chief of Naval Operations for Logistics, Navy user needs have been identified in a Technology Development Plan. This plan embraces seven broad areas addressing Ship, Shore, and Aircraft Facilities; Ordnance/Material Management; and Installation Restoration. The plan is routinely reviewed and updated by appropriate Chief of Naval Operations staff offices. The Assistant Secretary of the Navy for Installations and Environment has established a Navy/Marine Corps Environmental R&D Panel to facilitate science applications to compliance needs. The Office of Naval Research sponsors annual Science and Technology reviews in this area. The Navy is an active participant in several interservice coordination groups such as Joint Depot Environmental Panel.

A DoD report titled, Tri-Service Environmental Quality R&D Strategic Plan, prepared by the Tri-Service S&T Reliance Environmental Quality Panels based upon the Services' User Requirements, received its final review in June 1993. This report provides the cornerstone for DoD coordination efforts to eliminate duplication and ensure effective and efficient utilization of resources. Coordination within the DoD is carried out by the Tri-Service S&T Reliance panels in civil engineering and environmental quality under the Tri-Service Joint Engineers. Once coordination within the DoD environmental community is complete, the Long Term R&D Strategy will be expanded to develop technical exchanges in areas of mutual interest among the three major SERDP participants.

## A2. Activities within Participating Agencies

A number of specific efforts have been developed to prevent duplication of research and development activities in the agencies (DoD, DOE, and EPA) participating in the program. Furthermore, effective lines of communication have been established between the participating agencies, NOAA, NASA and other government agencies, thereby reducing the likelihood of duplication.

The SERDP *Strategic Investment Plan I* emphasized many options for protecting, managing and restoring the environment. An executive action plan was developed from *Strategic Investment Plan I* to provide a more focused direction to SERDP. A vital part of this action plan was the establishment and implementation of a tri-agency Executive Working Group. One of its missions is to coordinate ongoing work to prevent duplication across the broad spectrum of environmental research and development, focus future efforts on promising options, encourage multi-agency technical cooperation in SERDP demonstration projects and recommend SERDP projects and plans to the SAB and SERDP Council.

At least one SERDP Program Review is planned to be held each year during an onsite visit by the Executive Director and appropriate program participants. The review will provide a technical forum for the exchange of ideas, discussion of investment strategy, program planning and execution and other management initiatives, plus the opportunity to openly establish programs which address common areas and mutually reinforce, rather than duplicate, each other.

Examples are presented below of actions presently underway in specific technical areas with DoD, EPA, DOE and others to coordinate and leverage existing activities relating to SERDP.

An interesting example of a multiagency (DoD, DOE and EPA) effort in Installation Restoration and Waste Management is the development of a site characterization and Analysis Penetrometer (SCAPS), a cone penetrometer system that can characterize hazardous waste site soils, perform a computer-assisted interpretation, and provide an on-site display of the results. This technology has potential for licensing under a Cooperative Research and Development Agreement (CRADA). Additional information on the cone penetrometer system is provided in Section H, p. 26, of this report.

The FY 1992 SERDP proposal, Definition and Demonstration of Remote Sensing Capability to Contribute to Environmental Understanding and Support for Environmental Issues, (pp. 3-5 of *Strategic Investment Plan I*), is a coordinated effort between DoD, EPA, and DOE. Topics addressed include establishment of data transfer and demonstrations related to the EPA's Environmental Monitoring and Assessment Program, DoD-Army's Integrated Training Area Management (ITAM) Program and DOE's Waste Site Assessment Activities. Another example of interagency coordination among SERDP participants is the FY 1992 SERDP project developed by DOE, Photovoltaics for Military Applications, (pp. 215-216 of *Strategic Investment Plan I*). The principal partners in this project are the DoD (OSD and the Photovoltaic Review

Committee, which includes the Office of Naval Research, the Air Force Engineering and Services Center and the U.S. Army Construction Engineering Research Laboratory) and the DOE (Office of Solar Energy Conversion and DOE's Sandia National, National Renewable Energy, Oak Ridge National and Lawrence Livermore National Laboratories). The DOE/DoD collaboration in this area is already underway, together with a number of outreach activities with industry.

The ARPA project, Acoustic Monitoring of Global Ocean Climate, (pp. 10-12 of *Strategic Investment Plan I*), combines several technical initiatives into a streamlined program involving multi-service, multi-agency and multi-lateral cooperation and coordination. ARPA will provide the overall program direction and will coordinate with military and civilian organizations, foreign governmental organizations, and research institutions. Coordination within DoD will be with the Navy and the Air Force, and within the U.S. Government with NOAA, NASA, DOE and NSF. At least nine foreign countries (Australia, Canada, France, India, Japan New Zealand, Norway, South Africa, and the USSR) have expressed an interest in participating in the acoustic monitoring program.

A number of DoD elements are involved with NASA in the development of the Earth Observing System (EOS) and on a larger scale, the Mission to Planet Earth (MPE) Program. While the systems involved in MPE will not be launched until the latter half of the 1990's, many of the SERDP efforts (such as those involved with global change) are apt to influence the design of experiments on EOS. A concerted effort will be made within SERDP to strengthen the bond with NASA and other Government agencies to insure that there is no unwarranted duplication of effort.

#### **Section B. Involvement with Federal Interagency coordinating entities such as the Federal Coordinating Council of Science, Engineering, and Technology.**

The U.S. Global Change Research Program (USGCRP) has been developed by the Committee on Earth and Environmental Sciences (CEES) of the Federal Coordinating Council of Science, Engineering, and Technology (FCCSET). *Strategic Investment Plan I*, (pp. 6-9 and pp. 10-12, respectively), contains two projects which directly relate to the USGCRP. These projects are:

Joint DoD and DOE Atmospheric Remote Sensing and Assessment Program for Global Climate Change, and Acoustic Monitoring of Global Ocean Climate.

The DoD representative to the FCCSET/CEES Subcommittee on Global Change Research is the Navy representative to the SERDP Council. This assures coupling with SERDP and the USGCRP.

The DoD representative to the FCCSET/CEES Subcommittee on Environmental Technology (SET) is the OSD staff officer for SERDP. This provides a direct coupling between SERDP and the SET.

EPA works through existing FCCSET mechanisms, e.g., the CEES, to coordinate its research and development activities in areas of major interest such as climate change.

DoD elements depend on organizations such as the National Research Council to obtain independent assessments that will guide future research. One example of this is the recently published report on Strategic Technologies for the Army (STAR). This report represents an independent evaluation of technologies that are apt to be of greatest importance to the Army in the years ahead, in terms of its military and infrastructure needs.

The National Research Council (NRC) has established a Commission on Life Sciences. Its Committee on Environmental Research was provided with details of the individual environmental research efforts currently underway in the DoD. Contact is also maintained between DoD and the Office of Management and Budget (OMB) and the Congressional Research Service (CRS).

**Section C. Each project selected or recommended by the Council for support and funding, including the duration of, and the total estimated or (if known) actual cost of --**

- (i) each such project supported during the fiscal year in which the plan is submitted and the preceding fiscal year; and,**
- (ii) each such project proposed for funding during the fiscal year in which the annual report is submitted and the following four fiscal years.**

Projects approved by the Council are described in *Strategic Investment Plans I & II*, including project duration and estimated cost. Tables I - V, pp. 9-16, show titles, executing organizations, and actual FY 1991/1992 funding received by projects described in *Strategic Investment Plan I*. Tables I - V also reflect the impact of the June 1992 rescission of funds and of the recommendations made by the SAB for those projects at or above \$1 million. As of August 1, 1992 all funds identified as "actual" in Tables I - V under the FY 1991/1992 heading had been released to the executing organizations. Funds listed under the FY 1992 Supplemental heading were released from October 1992 through January 1993.

**Tables VI - IX**, pp. 16-19, show titles, executing organizations, and actual FY 1992 Supplemental appropriation funds received by SERDP Phase II projects approved by the SERDP Council. These projects are described in *Strategic Investment Plan I* and *Strategic Investment Plan II*. **Tables X - XII**, pp. 20-21, summarize project and participant funding totals.

The *Strategic Investment Plan, FY 1993*, which included titles, executing organizations, and funds planned for the support of FY 1993 SERDP projects, was submitted for Congressional review in early August 1993.

Starting in FY 1994, SERDP will become part of the DoD budget submission. The next annual report, due March 1994, will report on the first year (FY 1994) of the five-year SERDP plan and on the projects planned for the following four years.

<b>TABLE I</b> <b>REMOTE SENSING TECHNOLOGY PROJECTS - PHASE I</b>		<b>FY 1991/ 1992 \$(000) Planned</b>	<b>FY 1991/ 1992 \$(000) Actual</b>	<b>FY 1992 Supplemental \$(000) Actual</b>
Definition and Demonstration of Remote Sensing Capability to Contribute to Environmental Understanding and Support for Environmental Issues	DSPO	8,600	0*	2,500**
Joint DoD and DOE Atmospheric Remote Sensing and Assessment Program for Global Climate Change	NRL	11,900	0*	5,000**
	DOE	23,500	0*	5,000**
Acoustic Monitoring of Global Ocean Climate	ARPA	20,000	0*	7,000**
* Rescission ** Congressional Interest	<b>REMOTE SENSING - PHASE I TOTAL</b>	<b>64,000</b>	<b>0*</b>	<b>19,500**</b>

**TABLE II**  
**INSTALLATION RESTORATION AND**  
**WASTE MANAGEMENT TECHNOLOGY**  
**PROJECTS - PHASE I**

		FY 1991/ 1992 \$'000) Planned	FY 1991/ 1992 \$'000) Actual	FY 1992 Supplemental \$'000) Actual
Basic Research and Development in Waste Management	DOE	4,200	3,047	1,153
Basic Research and Development in Environmental Restoration; New Insights on Natural Subsurface Heterogeneity	DOE	3,800	0	0
Plutonium and Uranium Metal Forming Technologies	DOE	6,100	5,500	600
<b>DOE - PHASE I TOTAL</b>		<b>14,100</b>	<b>8,547</b>	<b>1,753</b>
Develop and Demonstrate Effective Site Restoration, Pollution Prevention, and Pollution Control Technologies Applicable to Defense-Related Operations	EPA	9,700	6,533.6	4,547
<b>EPA - PHASE I TOTAL</b>		<b>9,700</b>	<b>6,533.6</b>	<b>4,547</b>
Composting of Explosives Contaminated Soil	Army	500	239	0
Nondestructive Decontamination of Chemical Agent Contaminated Structures	Army	3,500	1,675	0
Nondestructive Decontamination of Explosive/Propellant Contaminated Process Equipment	Army	300	144	0
Unexploded Ordnance (UXO) Detection	Army	1,100	526	0
Biomonitoring	Army	1,200	574	0
HAZMIN Technology for Tactical Vehicle Maintenance Operations	Army	1,000	250	750
Analytical Methods/Instrumentation Development	Army	1,200	574	0
Biomagnetic Separation Processes	Army	150	150	0
Use of Biomaterials for the Removal of Hazardous Chemicals for Contaminated Soils	Army	100	100	230
Waste Stream Cleanup by Enzymatic Oxidation in Non-Aqueous Solvents	Army	115	115	200
Enzymatic Decomposition of Energetic Materials	Army	290	290	0
Extraction & Recycling of LOVA Propellants Using Supercritical Fluids	Army	150	150	400
Fate & Transport in Seasonally Frozen Soil and Discontinuous Permafrost	Army	130	130	500
Identification and Testing of Non-Ozone Depleting Halon Agents	Army	125	125	300
Selective Recovery and Re-Use of Heavy Metals in Waste Streams with Bioengineered Polymers	Army	290	290	550
Effects of Sorption, Survival and Activity on Biological Treatment of Explosives and Organic Compounds	Army	250	250	500
<b>ARMY - PHASE I TOTAL</b>		<b>10,400</b>	<b>5,582</b>	<b>3,430</b>

**TABLE II (Continued)**  
**INSTALLATION RESTORATION AND**  
**WASTE MANAGEMENT TECHNOLOGY**  
**PROJECTS - PHASE I**

		FY 1991 1992 \$(000) Planned	FY 1991/ 1992 \$(000) Actual	FY 1992 Supplemental \$(000) Actual
In Situ Treatment of JP-5 and Fuel Oil Vapors in Unsaturated Soils	Navy	600	746	0
Underground Fuel Steam/Vacuum Removal	Navy	150	180	0
Small Arms Range Remediation	Navy	400	388	0
Heaped Soil Bioreactor	Navy	50	47	15
Underground Fuel Pump and Treat Demonstration	Navy	250	34	41
Coastal Area Capping Technology	Navy	200	91	167
PCB Decontamination Using Base Catalyzed Decomposition Processes (BCDP)	Navy	200	237	3
Fuel Contaminated Groundwater Treatment Using Photochemical Oxidation	Navy	45	28	23
Petroleum Contaminated Groundwater Treatment by Biological Processes	Navy	320	60	225
Slurry Bioreactors for HW Remediation	Navy	450	200	207
Penetrometer Transition/Validation	Navy	600	272	324
Penetrometer Chemical Sensors	Navy	430	267	122
Integrated Marine Risk Assessment Methodologies	Navy	570	353	303
Encapsulated or Immobilized Enzymes and Bacteria for Remediation of Fuel Spills	Navy	300	193	91
Buried Ordnance Detection	Navy	400	252	141
Mineralization of TNT to Innocuous End Products by Microorganisms	Navy	350	77	250
Chemical/Photochemical Processes for TNT/RDX Treatment	Navy	300	38	45
Biodegradation of Nitrate Esters	Navy	350	410	0
Characterization of Decomposition of Nitrate Esters	Navy	100	25	0
Range PEP Decontamination	Navy	150	0	0
Mobile Utility Support Equipment (MUSE) NOx Emissions Reduction	Navy	400	200	220
Leak Detection System for Large Underground Fuel Storage Tanks and Pipelines	Navy	500	156	353
Oxygen Breathing Apparatus Canister Disposal	Navy	145	391	6
Lithium Battery Disposal as Reactive Hazardous Waste	Navy	100	63	110
<b>NAVY - PHASE I SUBTOTAL</b>		<b>7,360</b>	<b>4,708</b>	<b>2,646</b>

**TABLE II (Continued)**  
**INSTALLATION RESTORATION AND**  
**WASTE MANAGEMENT TECHNOLOGY**  
**PROJECTS - PHASE I**

		FY 1991/ 1992 \$(000) Planned	FY 1991/ 1992 \$(000) Actual	FY 1992 Supplemental \$(000) Actual
<b>NAVY - PHASE I SUBTOTAL</b>		<b>7,360</b>	<b>4,708</b>	<b>2,646</b>
Propellant Ingredient Extraction	Navy	100	156	0
Solventless Processing of Magnesium Teflon Viton (MTV) and Magnesium-Teflon Hytemp (MTH) Pyrotechnics	Navy	150	55	54
Explosive Waste as Fuel	Navy	100	250	60
Propellant Recycling	Navy	200	0	158
Ultraviolet Destruction of Nitrate Esters	Navy	300	170	192
Pyrotechnic Dye Incinerator	Navy	250	158	50
Bilge Waste Treatment System	Navy	400	672	158
Hazardous Material Shelflife Extension	Navy	200	71	60
Hazardous Material Control Technologies	Navy	400	236	71
Ship Paint Reformulation	Navy	500	315	185
Ship Abrasive Blast Recycling	Navy	560	0	288
Treatment of Waste Sodium Nitrite Solutions	Navy	120	66	0
Ship Surface Preparation and Paint Removal Technologies	Navy	250	50	200
Organic Protective Coatings and Application Technology	Navy	500	277	471
Non-Chlorinated Strippers and Low VOC Solvents	Navy	300	159	141
Aircraft Depainting Technology	Navy	500	29	93
Electroplating Waste Reduction	Navy	340	170	72
A/C Maintenance Chrome Replacement	Navy	200	160	28
IVD Aluminum	Navy	50	103	35
Aluminum-Manganese Electroplating from a Molten Salt Bath	Navy	100	35	103
HALON Replacement	Navy	120	120	0
Reduced Solids Precipitation Technology	Navy	100	75	0
<b>NAVY - PHASE I TOTAL</b>		<b>13,100</b>	<b>8,035</b>	<b>5,065</b>

**TABLE II (Continued)**  
**INSTALLATION RESTORATION AND**  
**WASTE MANAGEMENT TECHNOLOGY**  
**PROJECTS - PHASE I**

		FY 1991/ 1992 \$'000) Planned	FY 1991/ 1992 Actual Phase I	FY 1992 Supplemental Actual Phase I
In-Situ Contaminant Mobility Reduction Using Surfactants	Air Force	105	105	0
Zero Discharge Plan Development	Air Force	500	500	0
Enhanced Anaerobic Degradation of Fuels in Groundwater	Air Force	200	200	0
Enhanced Redox Biodegradation	Air Force	400	400	163
Spray Casting as an Alternative for Electroplating	Air Force	650	650	0
Abiotic Degradation of Groundwater Contaminants	Air Force	160	78.2	0
Demonstration of Low Temperature Ashing for PMB Waste Treatment	Air Force	350	350	500
Toxicology	Air Force	1,000	1,000	0
Validation of Aphon Oxygen Enrichment of Subsurface	Air Force	300	0	60
Halon 1301 Aviation System Replacement	Air Force	300	555	0
Halon 1301 Facility Total Flood Agent Replacement Program	Air Force	400	448	0
Non-Toxic Surface Preparations for Aluminum and Titanium Structural Alloys	Air Force	100	100	**300
Crossflow Air Stripping with Catalytic Oxidation	Air Force	650	650	450
Minimal Treatment Option for JP-4 Contaminated Soil	Air Force	250	0	0
Alternative Solvents/Technologies for Paint Stripping	Air Force	300	250	905
Improved Hydrocarbon Remediation Monitoring	Air Force	400	0	400
Prototype VOC Monitor, Phase 3	Air Force	203	0	0
Pulsed Hydraulic Flushing	Air Force	300	300	0
Treatment of Chlorinated Organics with Above Ground Bioreactors	Air Force	400	381.8	305
Pilot-Scale Validation of Liquid Phase Oxidation	Air Force	300	200	0
Groundwater Transport in Model Systems	Air Force	80	164.8	0
Biodegradation Technology for Hazardous Waste Treatment	Air Force	200	0	0
Chemical Characterization of Carbonaceous Materials from Aquifers	Air Force	150	0	0
Advanced Microporous Membranes	Air Force	120	0	0
Spill Remediation Guide	Air Force	150	0	0
Demonstration of Soil Washing at Beale AFB with EPA (SITE Program)	Air Force	587	0	**50
** Phase II Funds	<b>AIR FORCE - PHASE I SUBTOTAL</b>	<b>8,555</b>	<b>6,332.8</b>	<b>2,783</b>

**TABLE II (Continued)**  
**INSTALLATION RESTORATION AND WASTE**  
**MANAGEMENT TECHNOLOGY PROJECTS**  
**PHASE I**

		FY 1991/ 1992 \$(000) Planned	FY 1991/ 1992 \$(000) Actual	FY 1992 Supplemental \$(000) Actual
<b>AIR FORCE - PHASE I SUBTOTAL</b>		<b>8,555</b>	<b>6,332.8</b>	<b>2,783</b>
Emerging Technologies with EPA - Support of SITE Program	Air Force	600	0	**286
Bioventing Demonstration with EPA	Air Force	175	148.2	247
Metabolic Pathways Control	Air Force	210	0	0
Anaerobic Dechlorination of C <sub>1</sub> and C <sub>2</sub> Organics	Air Force	50	0	0
Catalytic Destruction of Chlorinated Organics	Air Force	90	0	0
Fiber Optic Monitoring System Development (p. 18 also)	Air Force	190	0	191
Systems Integration for Monitoring Technologies	Air Force	250	437	0
Improved Methods for Monitoring Fuel Biodegradation	Air Force	400	35	0
Biodegradation of Energetic Materials	Air Force	130	0	0
Enhanced Biodegradation through Soil Venting	Air Force	450	0	0
Packed Tower Air Stripping	Air Force	150	0	0
In-Situ Biodegradation of Jet Fuels	Air Force	200	0	0
Electrolytic Reduction of Chlorinated Hydrocarbon Compounds	Air Force	50	0	0
--Phase II Projects Supported with Phase I Funds (Project titles are listed in Table VII, p. 18.)	Air Force	N.A.	N.A.	1,226
** Phase II Funds	<b>AIR FORCE - PHASE I TOTAL</b>	<b>11,500</b>	<b>6,953</b>	<b>4,447</b>
<b>DoD - PHASE I TOTAL</b>		<b>35,000</b>	<b>20,570</b>	<b>12,942</b>
<b>DOE - PHASE I TOTAL</b>		<b>14,100</b>	<b>8,547</b>	<b>1,753</b>
<b>EPA - PHASE I TOTAL</b>		<b>9,700</b>	<b>6,533.6</b>	<b>4,547</b>
<b>INSTALLATION RESTORATION AND WASTE MANAGEMENT - PHASE I TOTAL</b>		<b>58,800</b>	<b>35,650.6</b>	<b>19,242</b>

**TABLE III**  
**CLEAN ENERGY/CONSERVATION**  
**TECHNOLOGY PROJECTS**  
**PHASE I**

		FY 1991/ 1992 \$(000) Planned	FY 1991/ 1992 \$(000) Actual	FY 1992 Supplemental \$(000) Actual
Photovoltaics for Military Applications	DOE	4,000	4,000	0
Windfarm for Military Applications (p. 19 also)	DOE	1,500	1,500	0
Advanced Technology Assessment and Demonstration of Energy Efficient & Renewable Energy Technologies in DoD Facilities	DOE	2,300	0	2,300
Solar Detoxification of DoD Explosives in Soils	DOE	1,000	0	0
<b>DOE - PHASE I TOTAL</b>		<b>8,800</b>	<b>5,500</b>	<b>2,300</b>
Clean Energy/Conservation*	Army	2,700	2,504	196
* Under Installation Restoration in <i>Strategic Investment Plan I</i>				
<b>DoD - PHASE I TOTAL</b>		<b>2,700</b>	<b>2,504</b>	<b>196</b>
<b>CLEAN ENERGY/CONSERVATION - PHASE I TOTAL</b>		<b>11,500</b>	<b>8,004</b>	<b>2,496</b>

**TABLE IV**  
**OTHER TECHNOLOGY PROJECTS**  
**PHASE I**

		FY 1991/ 1992 \$(000) Planned	FY 1991/ 1992 \$(000) Actual	FY 1992 Supplemental \$(000) Actual
Supercomputer Procurement, Installation, and Operation to Support the Arctic Region Supercomputing Center (ARSC) - University of Alaska	Army	*25,000	*25,000	0
Transfer of Information Related to Global Change Research - Consortium for International Earth Science Information Network (CIESIN)	DSPO	**1,200	*1,200	0
Supercomputing Support - National Supercomputing Center for Energy and the Environment (NSCEE) - University of Nevada, Las Vegas	Navy	***3,000	*3,000	0
Research to Characterize Environmental and Health Problems Associated with Defense-Related Operations	EPA	6,200	3,219.4	1,600
Development of Manuals of Practice on Innovative Technologies (DoD/EPA)	Army	250	250	0
Review of Environmental R&D Requirements, Identification of Functional Responsibilities, and Development of a Long Term R&D Strategy (DoD)	Army	250	0	0
<b>DoD - PHASE I TOTAL</b>		<b>29,700</b>	<b>29,450</b>	<b>0</b>
<b>EPA - PHASE I TOTAL</b>		<b>6,200</b>	<b>3,219.4</b>	<b>1,600</b>
<b>OTHER - PHASE I TOTAL</b>		<b>35,900</b>	<b>32,669.4</b>	<b>1,600</b>

\* Congressional Interest, \*\* Under Remote Sensing/DSPO in *Strategic Investment Plan I*, \*\*\* Under Remote Sensing/NRL in *Strategic Investment Plan I*

**TABLE V**  
**FUNDING SUMMARY**  
**SERDP TECHNOLOGY PROJECTS**  
**PHASE I**

	FY 1991/ 1992 \$(000) Planned	FY 1991/ 1992 \$(000) Actual	FY 1992 Supplemental \$(000) Actual
Remote Sensing	59,800	0	19,500
Installation Restoration and Waste Management	58,800	35,650.6	19,242
Clean Energy/Conservation	11,500	8,004	2,496
Other Technology Projects (Congressional Interests)	35,900	32,669.4	1,600
<b>PROJECT TOTAL:</b>	<b>166,000</b>	<b>76,324</b>	<b>42,838</b>
FY 1992 Sci. Advisory Board (SAB) and Council Support	1,500	550	381.25
*Expired, **FY 1993 SAB & Council Support, #Undist.	N.A.	*350	**1,000, #6.75
<b>PROGRAM TOTAL</b>	<b>167,500</b>	<b>77,224</b>	<b>44,226</b>
OSD Adjustments	N.A.	1,816	974
<b>APPROPRIATION TOTAL (†69,040, FY 1991; 10,000, FY 1992)</b>	<b>N.A.</b>	<b>†79,040</b>	<b>45,200</b>

**TABLE VI**  
**REMOTE SENSING TECHNOLOGY PROJECTS**  
**PHASE II**

	FY 1992 Supplemental \$(000) Planned	FY 1992 Supplemental \$(000) Actual
Multispectral R&D for Environmental Analysis and Mapping	Army	400
Deep Permafrost Borehole Sites in Alaska	Army	450
Analysis of Submarine Acquired Ice Draft Data	Army	250
<b>ARMY - PHASE II TOTAL</b>	<b>1,100</b>	<b>1,073</b>
Numerical Sensitivity Studies for the Design of an Ocean Observing System	Navy	200
Instrumentation Development - Drifting Buoys	Navy	700
Marine Mammal Studies	Navy	300
Regional Time Series Surveys	Navy	300
Analysis of Submarine Acquired Ice Draft Data	Navy	100
DoD Global Change Research Program	Navy	100
<b>NAVY - PHASE II TOTAL</b>	<b>1,700</b>	<b>1,659</b>
Rem. Sensing, In-Situ, Lab Meas. for Assessment of Atm. Polln from USAF Ops.	Air Force	320
Atmospheric Radiance Algorithms for Global Remote Sensing	Air Force	320
<b>AIR FORCE - PHASE II TOTAL</b>	<b>640</b>	<b>840</b>
<b>REMOTE SENSING - DoD - PHASE II TOTAL</b>	<b>3,440</b>	<b>3,572</b>

**TABLE VII**  
**INSTALLATION RESTORATION AND WASTE**  
**MANAGEMENT TECHNOLOGY PROJECTS**  
**PHASE II**

		FY 1992 Supplemental \$(000) Planned	FY 1992 Supplemental \$(000) Actual
Innovative Treatment of Contaminated Groundwater at McClellan Air Force Base (AFB), Davis, California	DOE	1,100	1,200
Environmentally Safe Disposal of Explosive Wastes	DOE	1,700	1,800
Rapid Screening Reversible Sensor for Environmental Screening and Monitoring	DOE	500	700
<b>DOE - PHASE II TOTAL</b>		<b>3,300</b>	<b>3,700</b>
Development, Evaluation and Application of Biomarkers for Munition Exposure Monitoring	Army	180	176
Develop Mathematical Models for Subsurface Flow and Contaminant Transport	Army	720	703.5
Elimination of Depleted Uranium (DU) in Kinetic Energy (KE) Penetrators	Army	450	450
Elimination of Chlorinated Solvent Use in Red Phosphorus (RP) Munitions Manufacture	Army	230	230
Alternate Processes for Liquid Propellant Manufacture	Army	450	450
Cadmium Plating Alternatives	Army	270	270
Environmentally Acceptable Metal Cleaning	Army	230	0
Investigation of Aqueous Cleaning System to Replace CFC Vapor Degreaser	Army	120	120
Replacement for Chlorinated Solvents in Rocket Motor Primers & Tackifiers	Army	250	250
<b>ARMY - PHASE II TOTAL</b>		<b>2,900</b>	<b>2,649.5</b>

**TABLE VII (Continued)**  
**INSTALLATION RESTORATION AND WASTE**  
**MANAGEMENT TECHNOLOGY PROJECTS**  
**PHASE II**

		FY 1992 Supplemental \$(000) Planned	FY 1992 Supplemental \$(000) Actual
Oil Spill Transport Prediction System	Navy	300	292
Naval Ship Systems Radiological Control Detection	Navy	500	488
Laboratory and Field Marine Bioindicator Systems	Navy	600	585
Shipboard Secondary and Tertiary Bilge Waste Treatment System	Navy	300	293
Navy Shipboard Hazardous Materials Reduction	Navy	300	293
Navy Non-Ozone Depleting Technology Clearinghouse	Navy	200	195
Ordnance Use/Disposal Risk Evaluation/Modeling	Navy	100	98
<b>NAVY - PHASE II TOTAL</b>		<b>2,300</b>	<b>2,244</b>
CFC, Hazardous and Toxic Materials Elimination	Air Force	450	450
Aerospace Systems Guidance and Control CRC Elimination Program	Air Force	500	**200 300
Radio Frequency Thermal Heating of Soil to Remove Volatile Organic Compounds	Air Force	860	**726 134
Manufacturing Technology for Large Aircraft Robotic Paint Stripping (LARPS)	Air Force	650	**300 350
Chemical Tank Rejuvenation	Air Force	250	250
Advanced Mixing Technology for Low NOx	Air Force	350	350
Fiber Optic Monitoring System Development (Additional funding)	Air Force	300	600
-Phase I Projects Supported with Phase II Funds (Project titles are listed in Table II, pp. 13-14)	Air Force	N.A.	636
<b>AIR FORCE - PHASE II TOTAL</b>		<b>3,360</b>	<b>3,070</b>
e ~ Scrub - The Application of DNA Pulsed Power to Electron Scrubbing of Flue Gas to Remove Unwanted By-Products *	DNA	6,000	6,000
* Congressional Interest	<b>DNA - PHASE II TOTAL</b>		<b>6,000</b>
<b>DoD - PHASE II TOTAL</b>		<b>14,560</b>	<b>13,963.5</b>
<b>DOE - PHASE II TOTAL</b>		<b>3,300</b>	<b>3,700</b>
<b>INSTALLATION AND WASTE MANAGEMENT - PHASE II TOTAL</b>		<b>17,860</b>	<b>17,663.5</b>

**TABLE VIII**  
**CLEAN ENERGY/CONSERVATION**  
**TECHNOLOGY PROJECTS**  
**PHASE II**

		FY 1992 Supplemental \$(000) Planned	FY 1992 Supplemental \$(000) Actual
Photovoltaics for Military Applications	DOE	800	0
Geothermal Heat Pumps	DOE	400	500
Solar Thermal Dish/Stirling for DoD Applications	DOE	800	900
Windfarm for Military Installations (Additional Funding)	DOE	1,300	1,385
<b>DOE - CLEAN ENERGY/CONSERVATION - PHASE II TOTAL</b>		<b>3,300</b>	<b>2,785</b>

**TABLE IX**  
**FUNDING SUMMARY**  
**SERDP TECHNOLOGY PROJECTS**  
**PHASE II**

		FY 1992 Supplemental \$(000) Planned	FY 1992 Supplemental \$(000) Actual
Remote Sensing		3,440	3,572
Installation Restoration and Waste Management		17,860	17,663.5
Clean Energy/Conservation		3,300	2,785
<b>PROJECT TOTAL</b>		<b>24,600</b>	<b>24,020.5</b>
Scientific Advisory Board and Council Support		0	180
Undistributed		N.A.	1.5
<b>PROGRAM TOTAL</b>		<b>24,600</b>	<b>24,202</b>
OSD Adjustments		N.A.	398
<b>APPROPRIATION TOTAL</b>		<b>N.A.</b>	<b>24,600</b>

<b>TABLE X</b> <b>FUNDING SUMMARY SERDP PROJECT TOTALS</b>	<b>FY 1991/ 1992 \$(000) Phase I Actual</b>	<b>FY 1992 Supplemental \$(000) Phase I Actual</b>	<b>FY 1992 Supplemental \$(000) Phase II Actual</b>	<b>Program \$(000) Totals</b>
<b>Remote Sensing</b>	<b>0</b>	<b>19,500</b>	<b>3,572</b>	<b>23,072</b>
<b>Installation Restoration and Waste Management</b>	<b>35,650.6</b>	<b>19,242</b>	<b>17,663.5</b>	<b>72,556.1</b>
<b>Clean Energy/Conservation</b>	<b>8,004</b>	<b>2,496</b>	<b>2,785</b>	<b>13,285</b>
<b>Other Technology Projects</b>	<b>32,669.4</b>	<b>1,600</b>	<b>0</b>	<b>34,269.4</b>
<b>PROJECT TOTAL</b>	<b>76,324</b>	<b>42,838</b>	<b>24,020.5</b>	<b>143,182.5</b>
<b>FY92 Sci. Adv. Brd. (SAB) &amp; Council Support</b>	<b>550</b>	<b>381.25</b>	<b>180</b>	<b>1,111.25</b>
<b>*Expired, **FY93 SAB &amp; Counc. Spt., #Undist.</b>	<b>*350</b>	<b>**1,000, #6.75</b>	<b>#1.5</b>	<b>1,358.25</b>
<b>PROGRAM TOTAL</b>	<b>77,224</b>	<b>44,226</b>	<b>24,202</b>	<b>145,652</b>
<b>Undistributed Congressional Adjustments</b>	<b>1,816</b>	<b>974</b>	<b>398</b>	<b>3,188</b>
<b>APPROPRIATION TOTAL</b>	<b>79,040</b>	<b>45,200</b>	<b>24,600</b>	<b>148,840</b>

<b>TABLE XI</b> <b>FUNDING SUMMARY SERDP PARTICIPANT TOTALS</b>	<b>FY 1991/ 1992 \$(000) Phase I Actual</b>	<b>FY 1992 Supplemental \$(000) Phase I Actual</b>	<b>FY 1992 Supplemental \$(000) Phase II Actual</b>	<b>Program \$(000) Totals</b>
<b>U.S. Army</b>	<b>33,336</b>	<b>3,626</b>	<b>3,722.5</b>	<b>40,684.5</b>
<b>U.S. Navy</b>	<b>11,035</b>	<b>10,065</b>	<b>3,903</b>	<b>25,003</b>
<b>U.S. Air Force</b>	<b>6,953</b>	<b>4,447</b>	<b>3,910</b>	<b>15,310</b>
<b>Defense Nuclear Agency (DNA)</b>	<b>0</b>	<b>0</b>	<b>6,000</b>	<b>6,000</b>
<b>Advanced Research Projects Agency (ARPA)</b>	<b>0</b>	<b>7,000</b>	<b>0</b>	<b>7,000</b>
<b>Defense Support Projects Office (DSPO)</b>	<b>1,200</b>	<b>2,500</b>	<b>0</b>	<b>3,700</b>
<b>U.S. Department of Defense (DoD) – TOTAL</b>	<b>52,524</b>	<b>27,638</b>	<b>17,535.5</b>	<b>97,697.5</b>
<b>U.S. Department of Energy (DOE)</b>	<b>14,047</b>	<b>9,053</b>	<b>6,485</b>	<b>29,585</b>
<b>U.S. Environmental Protection Agency (EPA)</b>	<b>9,753</b>	<b>6,147</b>	<b>0</b>	<b>15,900</b>
<b>PROJECT TOTAL</b>	<b>76,324</b>	<b>42,838</b>	<b>24,020.5</b>	<b>143,182.5</b>

**TABLE XII**  
**FUNDING**  
**SUMMARY**  
**PROJECT &**  
**PARTICIPANT**  
**TOTALS \$000**

**Section D. Amounts requested for SERDP for FY 1994.**

Through a Program Budget Decision (PBD) the Deputy Secretary of Defense approved the inclusion of SERDP at \$100 million in the Department's budget for FY 1994.

**Section E. Amounts requested for FY 1994 for each Federal laboratory.**

Amounts requested for FY 1994 for each Federal laboratory are expected to be available in January 1994 after the SERDP Council has approved the budget for the first year (FY 1994) of the five-year SERDP plan. These data will be included in the FY 1994 Annual Report.

**Section F. Amounts made available for FY 1993 to each Federal laboratory.**

Total amounts made available to each Federal laboratory from the FY 1991, FY 1992 and FY 1992-Supplemental Appropriations are shown in **Table XIII**, pp. 23-25.

Amounts to be made available to each Federal laboratory for FY 1993 will be known after the Congressional review of the FY 1993 program during August 1993. These data will be covered in the FY 1994 Annual Report.

**TABLE XIII**  
**LABORATORY FUNDING FROM THE FY 1991,**  
**FY 1992 & FY 1992-SUPPLEMENTAL APPROPRIATIONS**

	Total Funds \$(000)
<b>U.S. ARMY</b>	
Army Environmental Center, Aberdeen Proving Ground, MD	3,732
Biomedical Research and Development Laboratory, Fort Dietrick, MD	176
Construction Engineering Research Laboratory, Champaign, IL	2,700
Chemical Research, Development, & Eng. Center, Aberdeen Proving Ground, MD	795
Armament Engineering Directorate, Picatinny Arsenal, NJ	2,540
Army Research Laboratory, Aberdeen Proving Ground & Adelphi, MD	975
Cold Regions Research & Engineering Laboratory, Hanover, NH	1,313
Missile Command, Redstone Arsenal, Huntsville, AL	250
Natick Research, Development, & Engineering Center, Natick, MA	840
Tank Automotive Command - Research, Development, & Eng. Center, Detroit, MI	270
Topographic Engineering Center, Ft. Belvoir, VA	390
Waterways Experiment Station, Vicksburg, MI	1,453.5
<b>U.S. ARMY TOTAL</b>	<b>15,434.5</b>
<b>U.S. NAVY</b>	
ONR, Arlington, VA	1,268
NCEL, Port Hueneme, CA	4,535
NCCOSC, San Diego, CA	2,633
NSWC, Indian Head, MD	2,009
NAWC, Warminster, PA	1,512
NSWC, Carderock/Annapolis, MD	1,954
NRL, Washington, DC	6,482
NAVSEA (Code 5141), Washington, DC	1,183
Navy Com and Telecomm Sta, Norfolk, VA	232
NAWC, Lakehurst, NC	120
Portsmouth Naval Shipyard, Portsmouth, NH	75
<b>U.S. NAVY TOTAL</b>	<b>22,003</b>

<b>TABLE XIII (Continued)</b> <b>LABORATORY FUNDING FROM THE FY 1991, FY 1992 &amp; FY 1992-SUPPLEMENTAL APPROPRIATIONS</b>		Total Funds \$(000)
<b>U.S. AIR FORCE</b>		
Tyndall Air Force Base, FL		9,752
Wright Patterson Air Force Base, OH		2,655
Brooks Air Force Base, TX		1,563
Hanscom Air Force Base, MA		840
Norton Air Force Base, CA		500
	<b>U.S. AIR FORCE TOTAL</b>	<b>15,310</b>
	<b>U.S. DEPARTMENT OF DEFENSE TOTAL</b>	<b>52,747.5</b>
<b>U.S. DEPARTMENT OF ENERGY</b>		
Los Alamos Laboratories, NM		3,075
Lawrence Livermore Laboratory, CA		3,900
Oak Ridge National Laboratory, TN		2,290
Oak Ridge National Laboratory/Y-12, TN		500
Sandia National Laboratory, NM		10,250
Pacific Northwest Laboratory, WA		1,425
Argonne National Laboratories, IL		860
Idaho National Engineering Laboratory, ID		700
National Renewable Energy Laboratory, CO		6,585
	<b>U.S. DEPARTMENT OF ENERGY TOTAL</b>	<b>29,585</b>
<b>U.S. ENVIRONMENTAL PROTECTION AGENCY</b>		
Environmental Monitoring Systems Laboratory, Cincinnati, OH		504
Atmospheric Research & Exposure Assessment Lab, Research Triangle Park, NC		200
Environmental Research Laboratory, Athens, GA		4,359.2
Environmental Research Laboratory, Corvallis, OR		405

<b>TABLE XIII (Continued)</b> <b>LABORATORY FUNDING FROM THE FY 1991, FY 1992 &amp; FY 1992-SUPPLEMENTAL APPROPRIATIONS</b>		Total Funds \$(000)
<b>U.S. ENVIRONMENTAL PROTECTION AGENCY (continued)</b>		
Environmental Research Laboratory, Ada, OK		950
Environmental Research Laboratory, Gulf Breeze, FL		1,464.8
Environmental Research Laboratory, Narragansett, RI		500
Risk Reduction Engineering Laboratory, Cincinnati, OH		1,622
Air and Energy Engineering Research Laboratory, Research Triangle Park, NC		3,645
Environmental Criteria & Assessment Office, Cincinnati, OH		1,500
Center for Environmental Research Information, Cincinnati, OH		600
Office of Research and Development, Washington, DC		150
<b>U.S. ENVIRONMENTAL PROTECTION AGENCY TOTAL</b>		<b>15,900</b>
<b>TOTALS</b>		
DoD LABORATORIES		52,747.5
DOE LABORATORIES		29,585
EPA LABORATORIES		15,900
<b>LABORATORY TOTALS</b>		<b>98,232.5</b>
<b>OTHER FUNDING ITEMS</b>		
Defense Agencies		16,700
Arctic Supercomputer		25,000
Supercomputing Support		3,000
DoD/EPA Manuals		250
<b>OTHER FUNDING TOTAL</b>		<b>44,950</b>
FY 1992 Scientific Advisory Board and Council Support		1,111.25
FY 1993 Scientific Advisory Board and Council Support		1,000
Expired		350
Undistributed		8.25
Undistributed Congressional Adjustments		3,188
<b>TOTAL SERDP FUNDING</b>		<b>148,840</b>

**Section G. Description of any changes in military specifications recommended by the Council, actions to be taken to effectuate any such recommended changes on an expedited basis, and the projected date for each such change.**

To date the Council has not recommended any changes in military specifications. No actions have been recommended to be taken to effect any changes in military specifications.

**Section H. Description of all contracts, agreements, or other documents for cooperative research and development activities entered into pursuant to the Stevenson-Wydler Technology Innovation Act of 1980 during FY 1992.**

Although there are no contracts nor cooperative research and development agreements (CRADAs) in effect as yet, there are a number of emerging technological developments that warrant pursuit under CRADAs in support of SERDP. Some examples follow:

As noted earlier, the participating agencies have jointly developed a cone penetrometer system equipped with chemical sensors, SCAPS, that can be used to monitor hazardous disposal areas. SCAPS is an automated system with a cone penetrometer equipped with sensors that can be used to detect and monitor subsurface soil and groundwater contaminated with fuels. This achievement is being augmented through the addition of advanced fluorescence spectroscopy for detection of solvents, explosives and metals contamination. The technology is well suited to licensing for widespread field use.

Currently, the Army has no proven treatment technology for the "red water" effluent resulting from TNT production. "Red water" is the chemically reactive waste product that occurs normally during the manufacture of TNT. Wet air oxidation is being pursued to provide a means of neutralizing this waste. The process is promising and should provide an opportunity for cooperative agreements under which process development could be accelerated and ultimately licensed for use in the private sector.

A hot gas decontamination process is being vigorously pursued by the Government as a means to cleanse materials and structures that are contaminated by chemical agents or explosives. A comparable problem is faced by the U.S. chemical industry in terms of contaminated processing equipment and underground piping. This provides a significant opportunity for a joint government/industry effort.

**Section I. Plans for transferring technology and information to other governmental agencies and to nongovernmental organizations involved in environmental research and related matters.**

As a part of the executive action plan mentioned in Section A of this report, each funded SERDP project will be required to submit a Project Execution Plan that specifies a technology transition/transfer plan in FY 1993 stating the specific products to be transferred, to whom and when. Each SERDP investigator will also be requested to report on technology transition/transfer activities during the planned SERDP Program Reviews and in required periodic reports. Project proposals contained in the *Strategic Investment Plan I*, describe various technology transfer items in the Benefits and in the Partners and Related Activities sections.

Technology and information will be transferred to other government agencies and to nongovernmental organizations in the form of technical reports, journal articles, and conference proceedings. The material will include improved methodologies, standardized protocols, and improved environmental technology selection and design criteria. Existing governmental technology transfer systems (such as the Defense Technology Information Center) will be utilized initially. In time, should the amount of specialized environmental information available demand, additional information access mechanisms will be added.

For many years, DoD (Army, Navy and Air Force), DOE and EPA have had programs to transfer scientific and technical information to the private sector. More recently all these agencies have developed a number of cooperative efforts with the private sector under the Federal Technology Transfer Act of 1986 (FTTA) to speed up the utilization of environmental technology. Many of these technology transfer activities were described in Section H.

The EPA project, Develop and Demonstrate Effective Site Restoration, Pollution Prevention and Pollution Control Technologies Applicable to Defense-related Operations, (pp. 34-37 of *Strategic Investment Plan I*), will provide the opportunity for EPA, DoD and DOE to share expertise to resolve existing and future environmental problems at defense-related installations. Many of the long-standing problems at these installations can be resolved cost-effectively by adopting technology familiar to EPA and its research staff. The adaptation of existing technologies to specific defense-related applications will also save DoD and/or DOE engineers time and resources which would have otherwise been devoted to identifying and possibly demonstrating similar cleanup technologies. Emerging technologies and remediation approaches developed by EPA offer the potential of lower cost and/or higher cleanup effectiveness. Many of the results from this research could be utilized by the private sector to deal with similar problems.

Another EPA project, Research to Characterize Environmental and Health Problems Associated with Defense-Related Operations, (pp. 225-227 of *Strategic Investment Plan I*), will facilitate the sharing of data, methodologies and experience by EPA, DoD and DOE relevant to the successful design of safe, cost effective environmental management, pollution prevention and restoration strategies for defense-related operations, whether for continued facility operation,

or closure and return to commercial use. Substantial cost savings should be realized, since existing research programs of all participants will be leveraged and built upon. The potential to integrate and "standardize" sampling, measurement and assessment methodologies across agencies, particularly EPA, DoD and DOE, could materially accelerate progress toward cleanup and improved management of long standing problems.

In a novel technology development to use defense technology for environmental purposes, e~SCRUB - The Application of DNA Pulsed Power to Electron Scrubbing of Flue Gas to Remove Unwanted By-products, (pp. 51-53, TAB B of *Strategic Investment Plan II*), the Defense Nuclear Agency is involved in a collaborative effort with the Karlsruhe Nuclear Research Center. Together they are demonstrating the effectiveness of electron beam dry scrubbing (EBDS) for removal of air toxins and NO<sub>x</sub> from incinerators and powerplants using high sulfur content coal. With EBDS, a critical national environmental goal mandated by the Clean Air Act can be met without a devastating economic impact on the coal industry and the users of high sulfur coal.

**Section J. Description of plans to increase access by Federal government personnel, State and local government personnel, college and university personnel, industry personnel, and the general public to data, under the control of, or otherwise available to, the DoD, relevant to environmental matters.**

In 1991 the FCCSET Committee on Earth and Environmental Sciences (CEES) requested and received concurrence on a Data Management Policy for Global Change. That policy was developed by an interagency group with DoD participation and full support of the Navy Representative to the SERDP Council. As discussed in Section B, the SERDP Global Change projects directly relate to the U.S. Global Change Research Program (USGCRP). Their data management policy will be consistent with that adopted for the USGCRP by the FCCSET/CEES Subcommittee on Global Change Research.

The FY 1992 SERDP proposal, Definition and Demonstration of Remote Sensing Capability to Contribute to Environmental Understanding and Support for Environmental Issues, (pp. 3-5 of *Strategic Investment Plan I*), addresses the issue of data access. This effort includes a survey of existing archives of classified data products and related database capabilities. The current archive and access procedures will be evaluated with respect to preserving the archive and allowing access by a wider community of users. In addition, alternatives to existing procedures and policies which provide enhanced services will be investigated and implemented, as appropriate.

It is anticipated that this effort will lead to cooperation among DoD, DOE, NOAA, USDA, USGS, EPA, and other Federal agencies. This effort should promote the establishment of a well-defined process for accessing data and services that will enhance the mission accomplishment of Federal agencies and improve the environmental data available to the research community.

This project is also supporting Defense Meteorological Satellite Program (DMSP) digital data archive development at the NOAA National Geophysics Data Center in Boulder, CO. The DMSP archive effort will process, archive, and make available to global change and environmental scientists all image and in site DMSP data recorded on 8 mm tapes. These data provide researchers with a unique opportunity to utilize DoD remote sensing technology to monitor the Earth's environment on a global scale during both daytime and nighttime conditions.

In response to a Congressional request to create a team of scientists to determine the applicability of classified systems and data to environmental science, an Environmental Task Force (ETF) was planned and is now funded by SERDP to review the environmental community's needs; past, present and near-term classified systems and data/archives; and current government efforts that apply classified data to environmental issues. The ETF scientists will recommend release of specific classified information of value to the environmental community, as well as follow-on research opportunities.

Within Conference Report 102-328, SERDP funding was specified to be made "available for the Consortium for International Earth Science Information Network (CIESIN) to jointly study and develop mechanisms for transferring unclassified and recently declassified information to other government agencies and to non government organizations involved in global environmental change research." The resulting effort is supporting the establishment and demonstration of an Arctic region data base, accessible or distributed to user sites, to investigate various oceanographic and climatic phenomena associated with global change. By using existing technology, and incorporating DoD, DOE and other Arctic data sets, data will be available for investigating: point-source pollution impacts to Arctic and temperate coastal regions; atmospheric phenomena associated with changes in the Arctic environment; and human-induced changes to the Arctic environment and its effects on indigenous species and the environment.

**Section K. Additional recommendations or proposals, including proposals for legislation, relating to the Strategic Environmental Research and Development Program as the Council considers appropriate.**

10 U.S.C. §2902(b)(1) mandates that the Assistant Secretary of Defense responsible for matters relating to production and logistics shall be a member of the SERDP Council. Due to organizational changes within the Office of the Secretary of Defense, that position no longer exists. Responsibilities of that office are now those of the Deputy Under Secretary of Defense for Environmental Security. It is recommended that the pertinent legislation be modified to reflect this organizational change.

Due to an increased emphasis on the development of renewable energy, it is recommended that the DOE Assistant Secretary for Energy Efficiency and Renewable Energy be granted non-voting membership on the SERDP Council.

Furthermore, the DOE, "Director" of Environmental Restoration and Waste Management title has been changed to "Assistant Secretary of Energy for Environmental Restoration and Waste Management." The SERDP Council Membership should reflect this title change.